

• Find the zeros algebraically!

(a)  $f(x) = 6x^3 + 2x^2 - 20x - 16$

$2(3x^3 + x^2 - 10x - 8)$

(b)  $f(x) = x^3 + 3x + 1$

$-3 \rightarrow -35$

$-2 \rightarrow -13$

$-1 \rightarrow -3$

$0 \rightarrow 1$

$1 \rightarrow 5$

$2 \rightarrow \text{bigger}$

• Write the equation for the tangent line to  $f(x)$  through the point.

(a)  $y = \frac{1}{x-1}$  at  $x=2$

(b)  $f(x) = \sqrt{1+x}$  at  $x=0$

Rational Zero test

$\frac{\pm 1 \pm 2 \pm 4 \pm 8}{\pm 1 \pm 3}$

$$\begin{array}{r|rrrr} 2 & 3 & 1 & -10 & -8 \\ & & 6 & 14 & 8 \\ \hline & 3 & 7 & 4 & 0 \end{array}$$

$(2)(x-2)(3x^2+7x+4)$

$(2)(x-2)(x+\frac{4}{3})(x+1)$

zeros at  $x=2, -1, -\frac{4}{3}$

$$y = m(x - x_1) + y_1$$

↓  
slope  
derivative

$$y = -1(x - 2) + 1$$

$$y = -x + 3$$

$$f(x) = \frac{1}{x-1}$$

$$f(2) = \frac{1}{2-1} = 1$$

$$f(x) = (x-1)^{-1}$$

$$f'(x) = -(x-1)^{-2} \cdot (1)$$

$$\frac{dy}{dx} = -\frac{1}{(x-1)^2}$$

$$\left. \frac{dy}{dx} \right|_{x=2} = -\frac{1}{(2-1)^2} = -1$$

$$f(x) = \sqrt{1+x} \quad \text{at } x=0$$

$$f(0) = \sqrt{1+0} = 1 \quad \text{pt. } (0, 1)$$

$$f(x) = (1+x)^{\frac{1}{2}}$$

$$f'(x) = \frac{1}{2}(1+x)^{-\frac{1}{2}} \cdot (1)$$

$$\frac{dy}{dx} = \frac{1}{2\sqrt{1+x}}$$

$$\left. \frac{dy}{dx} \right|_{x=0} = \frac{1}{2\sqrt{1+0}} = \frac{1}{2}$$

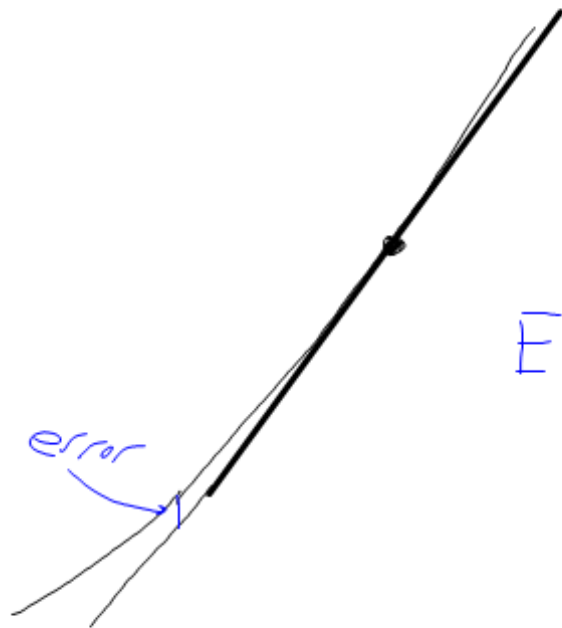
$$y = \frac{1}{2}(x-0) + 1$$

$$y = \frac{1}{2}x + 1$$

tangent line =  $L(x) \rightarrow$  linearization of  $f(x)$  at  $x$

$$L(x) = f(a) + f'(a)(x-a)$$

at pt.  $(a, f(a))$



Error

$$\left| f(a + \text{how far from pt.}) - L(a + \text{how far from pt.}) \right|$$

$$\left| f(121+2) - L(121+2) \right|$$

Find  $\sqrt{123}$

$$a = 121$$

$$f(a) = 11$$

$$f(x) = \sqrt{x}$$

$$f'(x) = \frac{1}{2\sqrt{x}}$$

$$L(x) = f(a) + f'(a)(x-a)$$

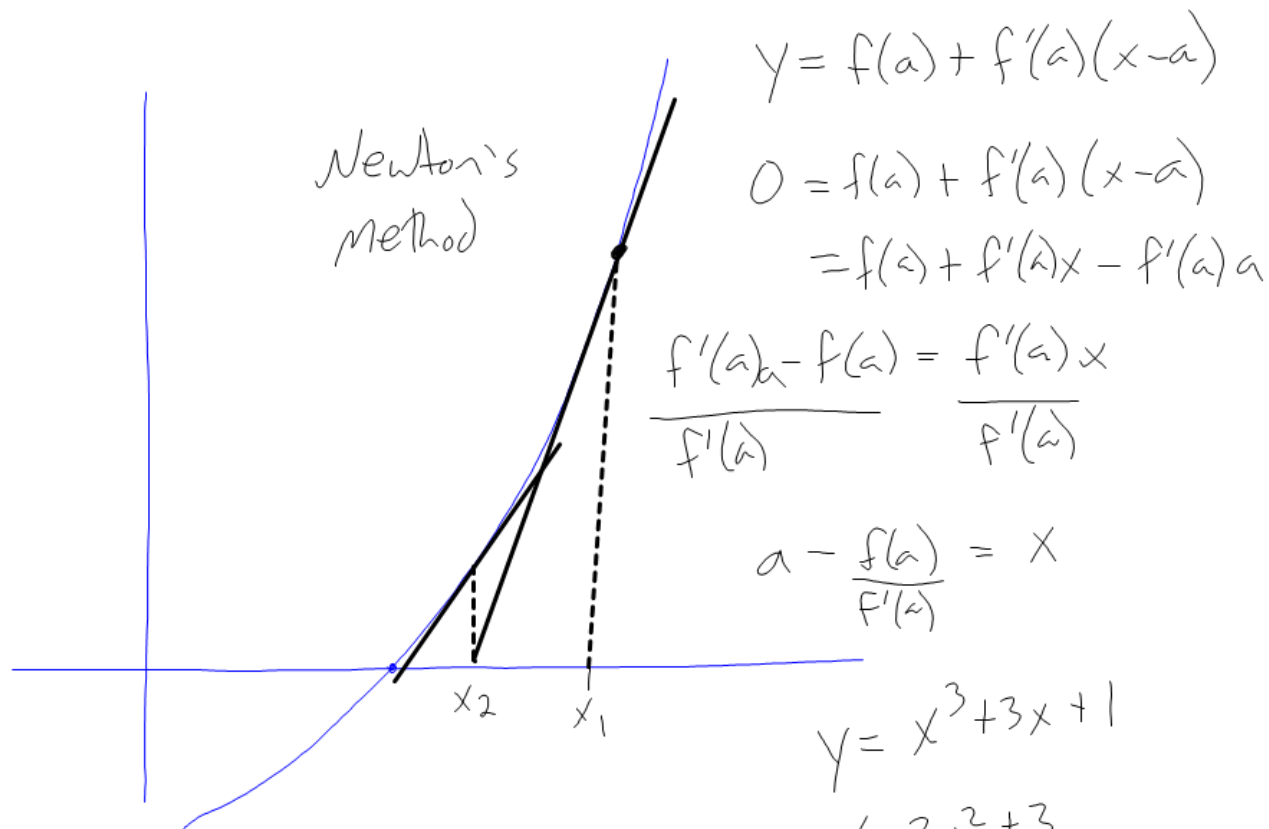
$$L(x) = 11 + \frac{1}{2\sqrt{121}}(x-121)$$

$$\left| f(123) - 11.\overline{09} \right|$$

$$L(123) = 11 + \frac{1}{2\sqrt{121}}(123-121)$$

$$= 11 + \frac{1}{22}(2)$$

$$= 11 + \frac{1}{11} = 11.\overline{09}$$



$$y = x^3 + 3x + 1$$

$$y' = 3x^2 + 3$$

$$x = a - \frac{x^3 + 3x + 1}{3x^2 + 3}$$

$$x = 0 - \frac{0^3 + 3(0) + 1}{3(0)^2 + 3}$$

$$x = -\frac{1}{3} - \frac{(-\frac{1}{3})^3 + 3(-\frac{1}{3}) + 1}{3(-\frac{1}{3})^2 + 3}$$

$$x = -\frac{1}{3} - \frac{(-\frac{1}{3})^3 + 3(-\frac{1}{3}) + 1}{3(-\frac{1}{3})^2 + 3}$$

etc.

Sect. 4.5

Quick Review #1,2,4

Problem Set #1,2,3,7,8,9,11,12,15-17